Maya SHIMOMURA
Brookhaven National Laboratory, Upton, NY, 11973, U.S.A.

PROFILE

I am an experimentalist working for high-energy heavy ion at Iowa State University as a postdoctoral research associate. I am a member of PHENIX Collaboration and I was a member of ALICE collaboration. My main interest is studying the boundary condition of the produced QGP matter by measuring the flow in relativistic heavy ion collisions.

PAST POSITION

Postdoctoral Fellow, University of Tsukuba, Ibaraki, Japan,
2009 Feb – 2011, April
Supervised by Yasuo Miake and Shinichi Esumi

DEGREES

University of Tsukuba, IBARAKI, Japan
Ph.D. in physics **2009 November 31**
Thesis: "Systematic Study of Azimuthal Anisotropy for Charged Hadron in Relativistic Nucleus-Nucleus Collisions at RHIC-PHENIX"
University of Tsukuba, IBARAKI, Japan
M.A. in physics **2004 March 31**
Thesis: "Analysis of High p_T Charged Hadron in 200 GeV Au+Au Collisions at RHIC-PHENIX"
Nara Women's University, Nara, Japan
B.A. Honors in physics **2002 March 31**
Thesis: "Particle Production in Relativistic Heavy Ion Collisions"

RESEARCH EXPERIENCE

University of Tsukuba, IBARAKI, Japan
Analysis –charged hadron spectra, elliptic flow (v_2) **2003 – 2011**
2003-2005: inclusive charged hadron spectra in Au+Au at 200GeV

2004-2007: v_2 for inclusive charged hadron in Au+Au and Cu+Cu at 62.4 and 200 GeV

2007-2008: v_2 for identified charged hadrons (π/K/p) in Au+Au at 62.4 GeV

2007-2010: v_2 for identified charged hadrons (π/K/p) in Cu+Cu at 200 GeV

Calibration – reaction plane calibration for v_2 analysis **2005 – 2006**
Calibrated the reaction plane determined by several detectors such as BBC, Central arm and SMD in Run 5 (year 2005) at PHENIX.

Detector – Aerogel Cherenkov Detector (PHENIX) / Time of flight (PHENIX) /Electromagnetic Calorimeter (ALICE) **2003 – 2011**
R&D for the magnetic shield of the PMT used in the Aerogel Cherenkov Detector.

Constructed Aerogel Cherenkov Detector and installed to PHENIX experiment.

Maintained and repaired Aerogel Cherenkov Detector and Time of Flight Detector at PHENIX.

Constructing Electromagnetic Calorimeter at ALICE.

Simulation – PID capability simulation for Aerogel Cherenkov Detector / Eccentricity calculation **2003-2004**
Simulated the capability of the particle identification using the number of Cherenkov photons produced in Aerogel.

Calculated the participant eccentricity in Au+Au and Cu+Cu at 62.4 and 200 GeV, which was used in my analysis of v2 scaling.

PRESENTATIONS AT INTERNATIONAL CONFERENCES

The workshop for ALICE upgrades by Asian Countries 2011, Soule, Korea
Title: ALICE v_2 and RHIC v_2 **2011 March Invited talk**

Hot Quarks 2010, Hyeres, France
Title: Systematic study of v_2 at 62.4 and 200 GeV in Cu+Cu and Au+Au Collisions at RHIC-PHENIX **2010 June Invited talk**

2010 RHIC & AGS Annual Users' Meeting, NewYork, U.S.A.
Title: Systematic Study of Azimuthal Anisotropy for Charged Hadron in Relativistic Nucleus-Nucleus Collisions at RHIC-PHENIX **2010 June Poster**

Exotics from Heavy Ion Collisions, Kyoto, Japan
Title: K_T and quark number scaling of v_2 **2010 May Invited talk**

Third Joint Meeting of the Nuclear Physics Divisions of the APS and JPS 20 09, Hawaii, U.S.A.
Title: What We Have Learned From the Measurement of Azimuthal Anisotropy of Identified Particles in Relativistic Heavy ion collisions **2009 October Invited talk**

Quark Matter 2009, Knoxville, U.S.A.
Title: System Size and Collision Energy Dependence of v2 for Identified Charged Hadrons at RHIC-PHENIX **2009 April Invited talk**

The 2nd Asian Triangle Heavy Ion Conference 2008, Tsukuba, Japan
Title: Systematic Study of Elliptic Flow at RHIC **2008 October Invited talk**

DIFFRACTION 2008, Hyeres, France
Title: Systematic Study of Elliptic Flow at RHIC-PHENIX **2008 September Invited talk**

Quark Matter 2006, shanghai, China
Title: Measurement of Azimuthal Anisotropy for High p_T Charged Hadrons at RHIC-PHENIX **2006 November Poster**

Strange Quark Matter 2006, California, U.S.A.
Title: Elliptic Flow Measurement of High p_T Inclusive Charged Hadrons and Pions at RHIC-PHENIX **2006 March Poster**

Quark Matter 2005, Budapest, Hungary
Title: High-p_T π^0, η, Identified and Inclusive Charged Hadron Spectra from PHENIX **2005 August Invited Talk**

PRESENTATIONS AT JAPANESE (DOMESTIC) CONFERENCES

1) Fall JPS meeting, Yamagata University, Yamagata
2008, September, Talk
"Systematic Study of Elliptic Flow for Charged Hadron at RHIC-PHENIX"
2) Heavy Ion Cafe Workshop, University of Tokyo, Tokyo
2008, August, Invited Talk
"QGP Matter Probed by Elliptic Flow from RHIC to LHC"
3) Heavy Ion Pub Workshop, Nagoya University, Aichi
2008, June, Invited Talk
"QGP Matter Probed by Elliptic Flow from RHIC to LHC"
4) Research Center for Nuclear Physics workshop, Osaka University, Osaka
2007, October, Talk
"Systematic Study of Elliptic Flow at RHIC"
5) Fall JPS meeting, Hokkaido University, Hokkaido
2007 September, Talk
"The Study of Elliptic Flow for PID Hadron at RHIC-PHENIX"
6)Reaction of High Energy Nuclear at RHIC workshop, Matsumoto University ,Nagano
2007, February, Invited Talk
"Identified Hadron Production at low to mid p_T (~5.0GeV/c) in Au+Au and Cu+Cu Collisions"
7)Fall JPS meeting, Nara Women's University, Nara
2006, September, Talk
"The Study of Azimuthal Distribution for High p_T Charged Hadron at RHIC-PHENIX"
8) Spring JPS meeting, Tokyo University of Science, Tokyo
2005, March, Talk
"Measurement of Elliptic Flow for High p_T charged hadron at RHIC-PHENIX"
9)Spring JPS meeting, Kyushu University
2004, March, Talk
"The comparison of two methods for high p_T charged hadron background study in $\sqrt{s_{NN}}$ = 200GeV Au+Au collisions at RHIC-PHENIX"

MAIN PUBLICATIONS AND PROCEEDINGS

Phys. Rev. Lett. 105, 062301 (2010)
"Elliptic and hexadecapole flow of charged hadrons in Au+Au collisions at $\sqrt{s_{NN}}$ = 200 GeV"
Nucl.Phys.A830:183C-186C (2009)
"System Size and Collision Energy Dependence of v(2) for Identified Charged Hadrons at RHIC-PHENIX"
AIP Conf.Proc.1105:141-144 (2009)
"Systematic study of elliptic flow at RHIC-PHENIX"
Phys.Rev.C80:024909 (2009)
"Systematic Studies of Elliptic Flow Measurements in Au+Au Collisions at s**(1/2) = 200-GeV"
Study of nucleus 52. Suppl.3, 43-46 (2008)
"Systematic Study of Elliptic Flow at RHIC"
Int. J. Mod. Phys. E16, 1977-1981 (2007)
"Measurement of Azimuthal Anisotropy of High p_T Charged Hadron at RHIC-

PHENIX"
Nucl. Phys. A774, 457-460 (2006)
"High-p_T π^0, η, identified and inclusive charged hadron spectra from PHENIX"

MEMBERSHIPS

- 2009 - present: ALICE collaboration at CERN-LHC
- 2003 - present: PHENIX collaboration at BNL-RHIC
- 2004 - present: Physics Society of Japan
- 2000 - present: Science Academy of Tsukuba

A statement of research interests and expertise

[Background]

Under extreme condition such as high temperature and density, quantum chromodynamics (QCD) calculations performed on the lattice (LQCD) predicted a phase transition from hadron matter into plasma of quarks and gluons so called Quark-Gluon Plasma (QGP), where quarks and gluons are deconfined.

Many experimental results at Relativistic Heavy Ion Collider (RHIC) in Brookhaven National Laboratory have indicated that the QGP is created by the relativistic heavy ion collision in which two nuclei as heavy as gold (Au) accelerated to $\sqrt{s_{NN}}$ = 200 GeV hit each other. [Phys. Rev. Lett. 87, 052301 (2001); Nucl. Phys. A757, 1-2 (2005)]

By measuring the elliptic flow which is the one of the collective motion coursed by the self-interaction of the matter, however, it has been pointed out that the produced QGP matter seems to have a short mean-free-path and therefore, behave like ideal (or close to ideal) hydro with strong interaction, which is different from the predicted QGP behaving free gas where quark and gluons have a long mean-free-path. [Phys. Rev. Lett.91, 182301 (2003)]

In order to understand the equation of the state of the QGP matter, which is the one of the main arms in this QGP physics, it is very important for us to study the boundary condition (such as collision energy, number of participant nucleons and so on), above which the matter behaves like ideal hydro.

[Research interest and expertise]

I am interested in the boundary condition of the energy density to create the QGP. For this study, I think that it is possible to use **the strength measurement of the elliptic flow (v_2).**

From the recent experimental results, in the low and intermediate transverse momentum region (p_T < 4 GeV/c), it is found that v_2 is scaled with the number of quarks, independent of the collision energy and particle species, and consistent with the quark-recombination model at $\sqrt{s_{NN}}$ > 62 GeV. [PRL98, 162301 (2007)] In the recombination model, the elliptic flow of quarks is created at QGP phase, and then the similar-momentum quarks become together and form to the hadrons. This model premises the existence of the QGP phase, and the v_2 results don't seem to satisfy this quark number scaling at $\sqrt{s_{NN}}$ = 17 GeV at SPS where the QGP is considered not to be created although errors are too large to conclude this.

Moreover, **from my recent analysis at PHENIX, which is the systematic study of non-identified and identified v_2 at $\sqrt{s_{NN}}$ = 62 GeV and 200 GeV in Au+Au and Cu+Cu collisions, I found a scaling rule of v_2 which makes all measured v_2**

follow a universal curve, independent of the collision sizes (number of nucleons participating the collision), collision energies and particle species when the matter reaches enough energy density to behave hydro. [Nucl. Physc. A830: 183C-186C(2009)] Using this scaling, I can compare the v_2 results in the different collision size (different number of participants) and shape (such as Cu and Au) directly, and this enables finer scan of energy density than just changing the collision energies.

At recent run (Run 10), RHIC had various energy collisions and PHENIX successfully took these data. **I am willing to measure the identified v_2 (mainly π/K/p) of these data and examine the results at various energies with classifying the events by number of participants, and compare to the calculation of the hydro dynamical model in order to study the boundary condition of the matter reached QGP.**